

# On Baseline IT-Services to Support Enterprise Collaboration

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## Abstract

Enterprise Collaboration (EC) is a widely discussed subject. Due to this fact a variety of different opinions can be formed mainly based on the scientific discipline behind it. From our understanding Enterprise Collaborations are based on inter-organisational relationships between network members. The analysis and support of those relationships was one of the main objectives of the COIN IP project. In the first year of the project the main objective for the Baseline Enterprise Collaboration (EC) Services team was to consolidate and harmonise results from previous RTD projects concerned with Enterprise Collaboration. As a scientific result EC Baselines Services are able to support most dynamic enterprise collaborations, like Business Ecosystems, by harmonisation of individuals and organisations profiles under the same model.

**Keywords:** Baseline Services, Enterprise Collaboration, COIN IP

## 1. Introduction

Inter-organisational relations are gaining unprecedented momentum for enterprises (Zhao, 2000) and are a widely discussed subject. Many researchers reviewed the topic of such enterprise collaborations (EC). In collaboration, parties are more closely aligned in the sense of “working together” to reach the desired outcome, rather than that outcome being achieved through “individualistic” participation constrained by contextual factors such as those imposed by client-supplier relationships and pre-defined roles, like in supply chains. An EC is an alliance constituted by a variety of entities (e.g. organisations and people) that are largely autonomous, geographically distributed, and heterogeneous in terms of their operating environment, culture, social capital and goals, but that collaborate to better achieve common or compatible goals, and whose interactions are supported by computer networks (Camarinha-Matos et al., 2006). In today’s society, enterprise collaborations manifest in a large variety of forms, including virtual organisations, virtual enterprises, professional associations, industry clusters, professional virtual communities, collaborative virtual laboratories, etc.

EC has been a major catalyst in the 6<sup>th</sup> Framework Program of the European Commission. It led to several projects aiming at finding new paradigms for enterprises aggregation, synchronisation and cooperation in response to the more and more demanding and complex business opportunities coming from customers. The research done so far focuses on three different collaborative network contexts, from the most static to the most dynamic one:

- **Supply Chains**, where long term relations and stable organisational and economic structures among enterprises allow the adoption of the most optimised and important IT solutions;
- **Collaborative Networks**, where the SMEs long term aggregations (i.e. clusters, districts and “breeding environments” of ECOLEAD IP) are finalised to get the members prepared to create and sustain more short term and dynamic alliances based on specific business opportunities (i.e. virtual enterprises, virtual teams);

- **Business Ecosystems**, where SMEs are left free to evolve as they like, just following the market evolutionary law that it is the fittest species which survive (i.e. open networks, de-focused networks) and the ecosystem just supports and encourages this emergent and evolutionary approach by providing SMEs with several services (e.g. legal, organisational, ICT).

Significant results in the field of IT infrastructure and IT support to EC management have been achieved so far. But evidently they could not address properly the problem of EAI (Enterprise Applications Integration) and operational support to collaborative processes in the different industries and application domains.

## 2. Related Work

Recently, many projects have developed various collaborative systems which could be classified into systems for virtual teams, such as the inContext system (<http://www.in-context.eu>) or for virtual enterprises, such as ECOLEAD (<http://www.ecolead.vtt.fi>) or E4 (<http://e4.cognovis.de/>). The first type of systems is generic enough to be used in team collaboration of cross-enterprises but they are not integrated into real business context of enterprises in collaborative networks. The latter typically includes separate tools for different purposes in different life-cycle-phases of virtual enterprises (following Thoben and Jagdev 2001, Camarinha-Matos and Afsamarnesh 2005, Eschenbacher 2005, Seifert 2007):

1. EC Preparation (Sourcing of partners)
2. EC Formation and Setting up (Legal issues, contracts)
3. EC Operation (Day-to-day management)
4. EC Dissolution and Decomposition

While collaborative services are increasingly used for EC, a platform including well-integrated collaborative services which cover different aspects is missing, forcing the user to utilize different tools in separate ways. A detailed analysis of existing EC tools, in particular from the EU IST 6th Framework Program, has been performed. Table 1 summarises some major tools (a detailed survey can be found in (Sitek, 2008)).

**Table 1: Existing EC tools and systems**

Category	Software	Number of Tools	Tool Name
Web application	Tomcat	10	Virtual Breeding Environment Management (VMBS), Professional Virtual Community (PVC) Management and Governance, PVC Rewarding Tool, Requirement Identification Service (refQuest), E4 (Extended Enterprise Management in Enlarged Europe) Platform, Supported Indicator Definition (SID), Collaboration Opportunity Characterization (COC) Plan, Virtual Organization (VO) Model Repository, Partner Selection (PS), VO Formation
	Apache Web server	2	Collaboration Opportunity (CO) Finder, Customer Support Service (DISCO)
	Microsoft IIS	4	PVC Management and Governance, Planned, Mediated, and Ad-hoc Collaborations
Web service	Axis	2	Communication Service Set, Activity

			Management
Database	MySQL	9	PVC Management and Governance, PVC Rewarding Tool, Planned, Mediated, and Ad-hoc Collaborations, Communication Service Set, Activity Management, refQuest, DISCO
	PostgreSQL	5	VBMS, E4 Platform, CO Finder, COC-Plan, VO Formation
Programming Language	Java	10	VBMS, PVC Rewarding Tool, Communication Service Set, Activity Management, refQuest, SID, COC-Plan, VO Model Repository, PS, VO Formation
	C#	5	PVC Management and Governance, Planned, Mediated, and Ad-hoc Collaborations, E4 Platform
	PHP	2	CO Finder, DISCO

Most of the tools are specific for EC but some are generic, such as the Communication service set and the Activity Management service. Most of the shown tools did not follow the SOA paradigm but Web application, and they are designed to work in an isolated manner with a focus on the end user, not the service integrator. Thus, while useful for Enterprise Collaboration, most of the tools are designed for isolated use, diverse types of data are not integrated and it is difficult to compose different tools and services for newly-emerging collaboration needs. Moreover, the tools focus separately on Virtual Organisations and Professional Virtual Communities, while the business concept presented in this paper concentrates on dynamic enterprise collaborations between organisations and individuals in business ecosystems.

## EC Baseline Reference Model

The formal duration of enterprise collaborations describes the contractually fixed duration of that collaboration. It can be classified as unique if the intention is to realize just one product/offering based on a specific customer request. The collaboration can be classified as limited if the intention is to realize a fixed series of complex products. To support ability of collaboration and rapid formation of collaborative networks, the researchers came to the conclusion that it is necessary to have potential partners ready and prepared to participate in such collaboration. Therefore enterprise collaborations can be differentiated in different life-cycle phases. This preliminary study on life-cycle phases and on existing EC tools and systems led to the identification of the EC Baseline Reference Model. The different phase of the life-cycle does require various baseline services. Therefore they were the best candidates to be part of the EC Baseline Reference Model. The following picture shows the EC Baseline Reference Model along the EC life-cycle. A set of EC Services has been designed as an IT solution and implemented according to the EC Baseline Reference Model.

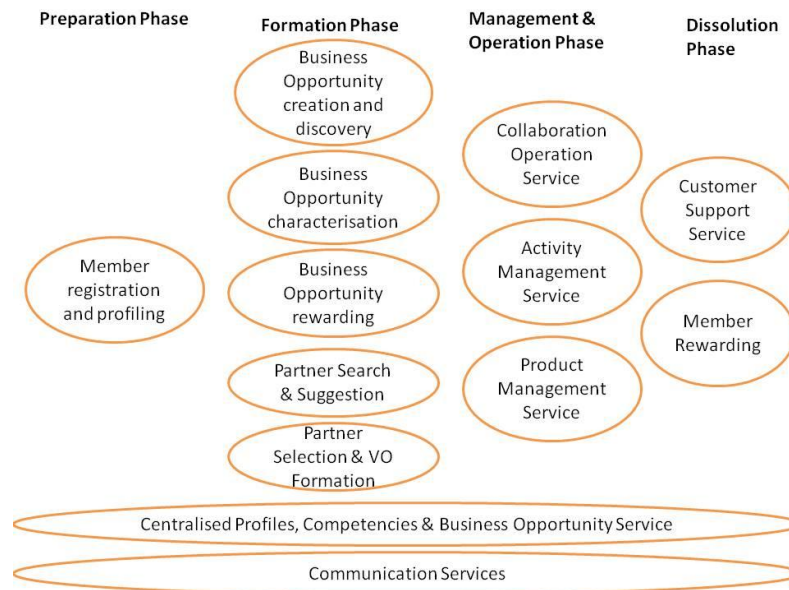


Figure 1: EC Baseline Reference Model

During the Preparation Phase of EC interested parties register and are able to define their profiles, e.g. editing administrative, contribution (product/ service), processes and performance data. The innovation lies in the combination in the management of originations and also individual profiles. This combination supports the management of highly dynamic collaborative networks like Business Ecosystems. Life-cycle independent communication web services are implemented to be used to announce news (like new members) and support communication between network members. The further innovative EC Baseline Service provides the possibility to either create a Business Opportunity (product/ service) from inside (based on the network competencies) or optional discovering Business Opportunity by market research. For the creation option a new serious game has been implemented that supports the creative ideation process between networks members. One member opens a creative session to seek for Business Opportunities and is able to sent invitation to other members by the Communication Service.

Once the Business Opportunity has been identified the Formation Phase starts and with the Business Opportunity Characterisation Service it is possible to define the Work-Break-Down-Structure (WBS), the tasks to be performed and the special competencies needed. Active members can be rewarded for their activities in seeking for Business Opportunities. Right partners for the characterised Business Opportunity are to find with the EC Partner Search Service following chosen search criteria. While finding the right partners the support of communication, discussion and agreements between members is also provided by the communication service. The selected partners for the specific Business Opportunities are to register and collaboration performance indicators are to be set for the Operational Phase.

Enterprise Collaboration Service and Product Management Services (PSM) support the Operational Phase of the collaborative network where the added value for the customer is to be realised. The PSM Service provides a structured storage in catalogues of all relevant product information and documentation to be realised. Complex products can be stored in different configurations. Following the (WBS), planned and mediated tasks can be defined for each network partner. Ad-hoc task force teams can be set up in critical collaboration situations. The execution of the defined tasks is supported by an activity service, which links acting people with used resources, and tracks the state of each task. Exchange of product data and progress information related to the tasks are supported by the communication service

again. Good collaboration performance can be rewarded and has a positive impact on the member's profile.

Finally during the Dissolution Phase it is possible to gather feedback from all active partners and the end customer and store the collaboration experience gained for a reuse in future Business Opportunities. Finally the end customer receives access to the product catalogue and product information.

## Conceptual architecture

Based on the analysis of existing tools in the field of Enterprise Collaboration, a conceptual architecture for a Baseline IT-Platform has been designed that follows the SOA model. The following picture shows the architecture that includes data, service and tool layers which aims at integrating and harmonising existing EC tools and services.

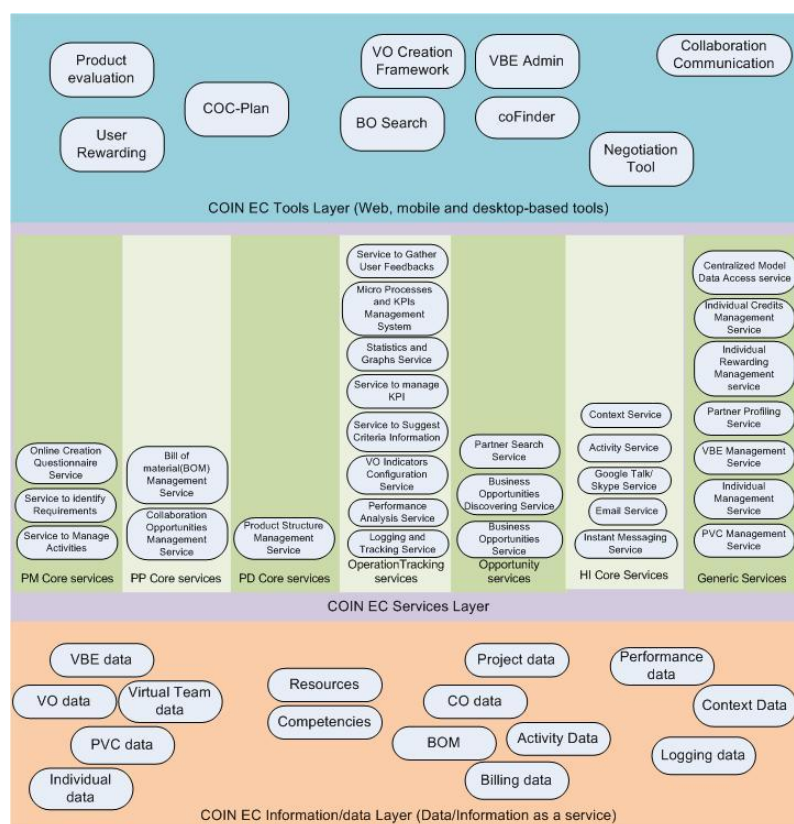


Figure 2: Conceptual architecture of the COIN Baseline EC software services and tools

Data, services, and tools for EC that was previously created in an integrated way including strong relationship between presentation, business logic and data access layers are decoupled in these three layers and integrated through SOA principles and technologies. Through the integration, a core set of services and tools has been realized available for use; services previously integrated and used by one tool now can be reused by other services or composed to support more complex scenarios. The central point of the EC Baseline IT services is the centralized model implemented as a database; data layer provides necessary data for any activities performed in the four phases of the EC lifecycle and the Business Opportunity to be achieved.

In the next picture the process of decoupling is shown from a software built to be used alone (on the left) where the three levels are integrated in the same environment to a software where

layers are completely separated; the business logic is provided as web service and data is gathered by usage of a centralized model.

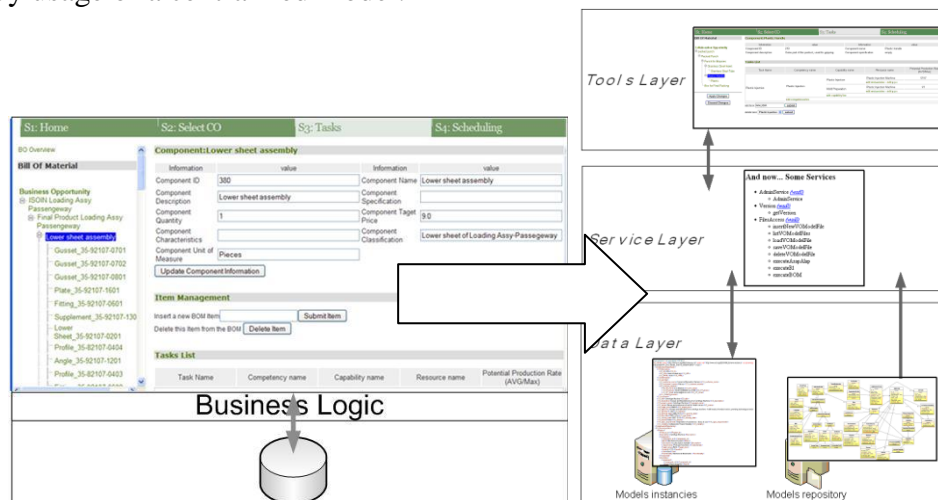


Figure 3: Example of decoupling of an existing software

During the decoupling the attention focused on the harmonisation of concept that previously have been taken completely separated: the organisation world (organisation, Virtual Organisation, cluster, etc) and the individual world (individual and virtual teams). The result is a model more than 60 entities implemented in 80 database tables allowing tools to share data in an easy way. In order to allow user to experience the whole EC Baseline services and tools has been provided a single point of access to the entire system: user should access to a portal based on Liferay by a single sign on mechanism based on Central Authentication Service (CAS). On the website are displayed circles representing baseline services available for the user role; by clicking on that the user can access to the desired tool.



Figure 4: Baseline IT Services Portal

The extension of the baseline IT service by inclusion of other services is easy because on the access of the common model allows new services to interact with data provided by existing services without knowledge about their internal processes.

## **Conclusion and key benefits**

Organisations need IT solutions that are able to support dynamic enterprise collaboration involving many organisations, individuals, resources and software services. First, due to the dynamics of collaboration and rapid formation of collaborative networks, these networks require different services for different collaboration phases (Camarinha-Matos, Afsarmanesh, 2006). By combining the management of organisations and individuals and their virtual forms, this approach supports the formation of highly dynamic collaborations including business ecosystems because rich sources of common data, such as profiles, product/service, processes and performance data, is linked and available in a common data-as-a-service. Converged collaboration services are provided by composing different services, i.e., communication services with other services to support realtime information dissemination among collaborators. Furthermore, a business opportunity (product/service) can be created from inside (based on the network competencies) or discovered through third party services. Third, business opportunities and collaborations are manageable through activities associated with individuals, teams, and their competencies and processes, and relevant product information and documents. Finally, through the portal, feedback can be collected and evaluated in a coherent way from individuals, organizations, customers and also from many software services to evaluate the success of collaborations. Such evaluations are valuable for determining trust and plans in future business opportunities.

The portal enables the composition of commodity EC services: many existing EC services are common because we can use them for different purposes. With such a portal, new EC services can be created through the composition of common EC services. The portal enables the acquisition of rich data sources for understanding collaboration interactions and performance evaluation. Without such a portal, it is very difficult, to obtain different kinds of data characterising interactions for analysis. With the portal, profiles, activities, operations, contexts, etc., can be logged and retrieved through a Web services-based platform, supporting many research activities, such as trust analysis and collaboration adaptation, which rely on realistic data for experiments.

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